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TITLE: Activated carbon with high catalytic activity - mfd. by carbonised and activating acrylonitrile cpds. or a mixt. contg. acrylonitrile

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ABSTRACTED-PUB-NO: JP 07024315A

BASIC-ABSTRACT:

Acrylonitrile cpds. or a mixt. contg. acrylonitrile is carbonized and activated.

USE/ADVANTAGE - Used to produce activated carbon with high catalytic activity, especially for the decompn. of hydrogen peroxide. Able to decompose hydrogen peroxide with high efficiency, and its concn. of a hazardous metal or heavy metal is extremely low, so that it is easily disposed into soil without environmental hazards.

In an example, acryl fibres, (where the concn. of acrylonitrile was 85 wt.%, were cut into short lengths less than 0.5 cm), then 65 wt.% was mixed with 25 wt.% of pitch and 10 wt.% of water to form a mixt. The mixt. was granulated (dia.=2mm, length=6mm), dried under the sun, heated at 400 deg. C, activated at 900 deg. C with water vapour for 2 hours and to produce an activated carbon. 300 mg of the activated

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Catalyst Activated Carbon
[Shokubai Kasseitan]

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TITLE	(54) : CATALYST ACTIVATED CARBON
FOREIGN TITLE	[54A] : SHOKUBAI KASSEITAN

[Claim 1] A catalyst activated carbon characterized by its production by carbonization of an acrylonitrile compound or an acrylonitrile mixture.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention relates to a catalyst activated carbon produced by carbonizing an acrylonitrile compound or an acrylonitrile mixture. In particular, it is effective for the decomposition of hydrogen peroxide.

[0002]

[Prior Art] Hydrogen peroxide has been used when bleaching textiles or foods, and also used during the cleaning process of semiconductors. However, unused hydrogen peroxide remains in the treated waste. An aqueous solution of 25% or higher hydrogen peroxide causes severe inflammation when it comes in contact with human skin or mucus. A 3% aqueous solution called oxidol has been used as a disinfectant. If waste solution containing residual hydrogen peroxide is discharged into rivers, it has an adverse effect in the ecological system. Thus, residual hydrogen peroxide is often treated using a heavy metal compound or mixture to decompose the hydrogen peroxide based on the principle of Fenton's Reagent, before discharging the waste solution into rivers. However, the decomposition ability of such heavy metal compounds or mixture deteriorates over time, and if they are discharged without a treatment then they may become the cause for further pollution. Even though they

* Claim and paragraph numbers correspond to those in the foreign text.

are regenerated, it will require time and costs.

[0003]

[Problems to be Solved by the Invention] The objective of the present invention is to produce a catalyst activated carbon which can decompose hydrogen peroxide without containing heavy metals, and when discarded after deterioration of decomposition ability can be used as a soil conditioner without causing secondary pollution.

[0004]

[Means for Solving the Problems] The inventors earnestly investigated various substances hardly containing metals in order to solve the aforementioned problems and it was confirmed that the activated carbon obtained by carbonizing acrylonitrile compounds or acrylonitrile mixtures can decompose hydrogen peroxide efficiently, and the decomposition ability is sustained even after repeated applications. This led to the achievement of the present invention.

[0005] Namely, the present invention is described as follows. A compound containing 1 to 100% of acrylonitrile or a mixture containing 1 to 100% of acrylonitrile is carbonized under an active, an inactive or a weakly active atmosphere and subsequently activated by an activation treatment containing no metals, such as an activation method using steam or oxygen. When the obtained activated carbon is added to hydrogen peroxide, foaming occurs vigorously such that hydrogen peroxide is decomposed. In this case, as the content or the mixing ratio of acrylonitrile is higher, the decomposition ability becomes greater. If woods are activated by carbonization by the same procedures, the foaming

rate is low and the decomposition rate of hydrogen peroxide is low. It is not particularly limited as long as the compound or mixture contains an acrylonitrile compound such as acrylic fibers, acryl-nitrile-butadiene-styrene copolymers, nitrile rubbers and the like, or a mixture containing thereof.

[0006]

[Operation] As mentioned above, the activated carbon obtained in the present invention hardly contains metals or heavy metals and can decompose hydrogen peroxide efficiently. For example, it can be used when decomposing residual hydrogen peroxide remaining in the waste water.

After deterioration of the decomposition ability, if it is added to soil, microorganisms tend to habitate easily in the pores made on the activated carbon surface such that it can be effectively reused as a soil conditioner.

[0007] The procedures for calculating the decomposition ability when used for decomposition of hydrogen peroxide will be explained below.

- (1) A 1000ppm aqueous hydrogen peroxide solution is prepared using commercial hydrogen peroxide and distilled water at 15°C.
- (2) Activated carbon to be used as a sample is crushed to 75 or less and after drying at 105°C for 2 hours, it is left to dry naturally.
- (3) An aqueous hydrogen peroxide solution 1000ml prepared in Process (1) is placed in a 3L beaker.
- (4) The activated carbon 300 mg prepared in Process (2) is added to the beaker described in Process (3), and mixed using a stirrer for 20 min. and then filtered.
- (5) A filtrate 15 ml is placed in a 100 ml sample tube and sulfuric acid

is added to make the solution acidic.

(6) A N/10 potassium permanganate is added until the solution is colored and the amount of addition by titration is calculated.

(7) A blank test is carried out using hydrogen peroxide without adding activated carbon and the amount of titration is calculated.

(8) Using the amounts calculated from Processes (7) and (8), the decomposition ability is calculated using the following formula:

$$\text{Decomposition ability (\%)} = \frac{(8) \text{Amount of titration} - (7) \text{ Amount of titration}}{(8) \text{Amount of titration}} \times 100$$

[0008]

[Embodiments] The present invention will be explained specifically with reference to the Embodiments and Comparative Examples below. However, the present invention will not be limited by these embodiments as long as the objective of the present invention is satisfied.

(Embodiment 1) Acrylic fibers containing 85% of acrylonitrile that were chopped into a size of 0.5 cm or less (65 wt%), pitch (25 wt%) and water (10 wt%) were placed in a granulator. After stirring, the mixture was molded under pressure into a granular product with a diameter of 2 mm and a length of 6 mm. The product was dried naturally under sunlight for 3 days. The granular product was then carbonized at 400°C in a carbonization furnace which was then elevated to 900°C such that the carbon was activated with steam for 2 hours to serve as activated carbon. The ability of the activated carbon to decompose hydrogen peroxide was 95%.

[0009] (Embodiment 2) The same procedure as described in Embodiment 1 was repeated except for using acrylic fibers containing 95% acrylonitrile

and the ability of the activated carbon produced to decompose hydrogen peroxide was 99%.

[0010] (Comparative Example 1) The same procedure as described in Embodiment 1 was repeated except for using Japanese cypress sawdust instead of acrylic fibers. The ability of the activated carbon produced to decompose hydrogen peroxide was 4%.

[0011]

[Effects of the Invention] As mentioned above, the catalyst activated carbon obtained by the present invention hardly contains metals or heavy metals, and efficiently decomposes hydrogen peroxide. When the catalyst activated carbon is discarded into soil, there is no danger of causing secondary pollution and the effect as a soil conditioner can be expected to be high.